Stroke in Tabuk, KSA: Awareness and prevalence of risk factors

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Abstract: Being the second leading cause of death and the most frequent cause of permanent disability in adults worldwide, the stroke caused by 90% of survivors having residual deficits. In this context, this study aimed to investigate the general awareness and prevalence of stroke risk factors in Tabuk in Saudi Arabia. To accomplish this mission, educational intervention campaigns were conducted in several public locations in Tabuk city using Stroke Risk Scorecard adopted by the National Stroke Association. The subjects participated in the study were educated about stroke risk factors and given a take-home message brochure containing important data regarding stroke, symptoms and its associated risk factors. Results revealed that the stroke and its risk factors were prevalent among the population of Tabuk city. This situation was even worsened by the lack of knowledge of the disease itself; the thing that urged participation of all the local community sectors including healthcare providers and universities through campaigns and other public education programs to increase public awareness.

1. Introduction

Neurological disorders account for 10.2% of global DALYs (disability-adjusted life years) and stroke account for 47.3% of the overall neurological disorders burden. Stroke ranked first among age-standardized DALY rates for neurological disorders globally and in the Middle East countries (Group, 2017). Many studies have reported that the Quality of Life (QOL) in stroke patients is much lower than the QOL of the general population during the first few years after the stroke, particularly with respect to the physical factors (Suenkeler et al., 2002). Stroke is the second leading cause of death worldwide, and the most frequent cause of permanent disability in adults worldwide (Barakat et al., 2014). According to the World Health Organization (WHO), around 15 million people, the world over, suffer from stroke each year (Robert *et al.*, 2014a). Despite advances in understanding the pathophysiology of cerebral ischemia, therapeutic options for acute ischemic stroke remain very limited (Woodruff *et al.*, 2011). The only treatment approved against ischemic stroke is the recombinant tissue plasminogen activator (rt-PA) which must be administered within 3 hours of stroke onset (Del Zoppo et al., 2009). This fact has led a recent effort to develop strategies for neural repair after stroke (Krupinski *et al.*, 2013) and improve the general awareness about the disease and its risk factors. Risk factors for stroke include arterial hypertension, diabetes mellitus, cigarette smoking, micro-vascular rupture, hyperlipidemia, and age (Benamer et al., 2009; Jowi et al., 2008)Stroke is
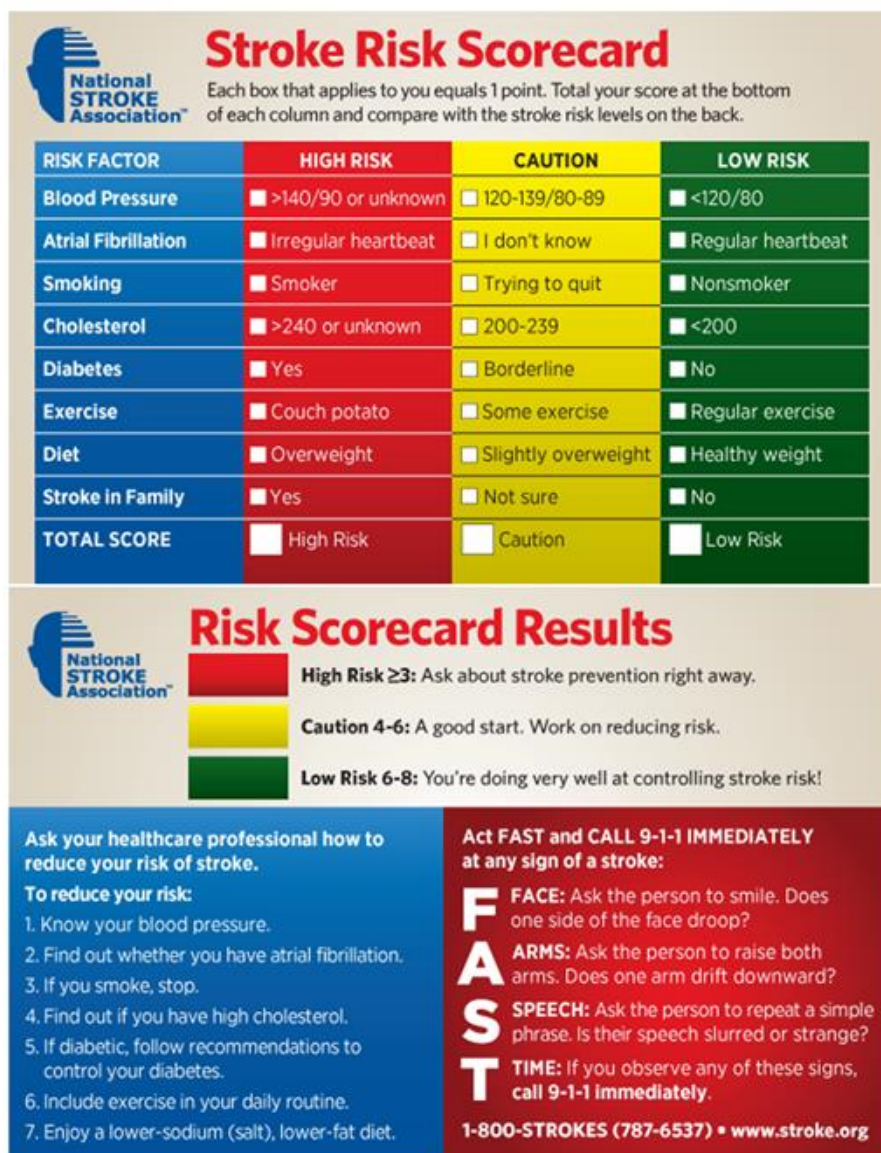
being observed as a rapidly growing problem and an important cause of illness and death in Saudi Arabia (Robert *et al.*, 2014b). In Saudi Arabia, the rate for first-ever incidence of stroke was estimated to be 29.8/100,000/year (al-Rajeh *et al.*, 1998). The risk factors significant for stroke in the Saudi population are systemic hypertension, diabetes mellitus, heart disease and smoking (al-Rajeh *et al.*, 1998; El Sayed *et al.*, 1999). Arab countries constitute populations with a similar lifestyle and diet that may influence stroke risk, type, and survival after stroke, as well as other features similar to the Western and Oriental populations (Benamer et al., 2009). Studies reported rates from 29.8 per 100 000 people in Saudi Arabia to 57 per 100 000 people in Bahrain (Tran et al., 2010). It is important to note that while the incidence of stroke is dropping in the West, it is probably ominously increasing in Asia (Khealani et al., 2008). A study on Saudi stroke patients found that the vessel most frequently involved was a portion of or the entire middle cerebral artery (Yaqub *et al.*, 1991). Acute occlusion of cerebral arteries results in immediate loss of oxygen and glucose to the core region of the affected brain tissue (Eltzschig *et al.*, 2011). Hence, a complex cascade involving a series of biochemical reactions is rapidly activated involving inflammatory mechanisms causing further cell death and functional deficits (Lakhan *et al.*, 2009). Inflammation leads to the recruitment/activation of specialized inflammatory cells into injured tissue to neutralize and eliminate the injurious stimuli (Chen *et al.*, 2010). Accumulation of leukocytes in the ischemic brain tissue results in

subsequent release of proinflammatory mediators. These mediators lead to secondary injury of potentially salvageable tissue within the penumbra (Hallenbeck, 1996). The mechanisms of stroke associated damage include; necrotic cell death, release of DAMPs, apoptotic pathway activation, activation of TLRs, transcription factor activation (NF-κB), activation of phospholipases (AA, DHA cascade) (Barakat *et al.*, 2013), BBB disruption (CAMs: ICAM, VCAM, MMPs), stimulation of brain angiotensin II system increasing expression of proinflammatory factors (Barakat *et al.*, 2014), aldose reductase activation which leads to osmotic and oxidative stress and arginase activation (leading to reduction in the bioavailability of NO)(Chang *et al.*,

1998). This study, therefore, aimed to investigate prevalence of stroke risk factors and raise the relevant public awareness in Tabuk city, in northwestern region of Saudi Arabia.

2. Material and Methods

Awareness campaign was conducted in public locations in Tabuk, KSA using the Stroke Risk Scorecard adopted from the National Stroke Association (Figure 1). A total of 500 subjects participated willingly in the study, were educated about stroke risk factors and provided with a take-home message brochure containing important data about stroke and its associated symptoms and risk factors.

Figure 1. Stroke Risk Scorecard

3. Results
3.1   Awareness of stroke symptoms

The general awareness about the characteristic symptoms of stroke was low (10-20 %) as shown in Figure 2.
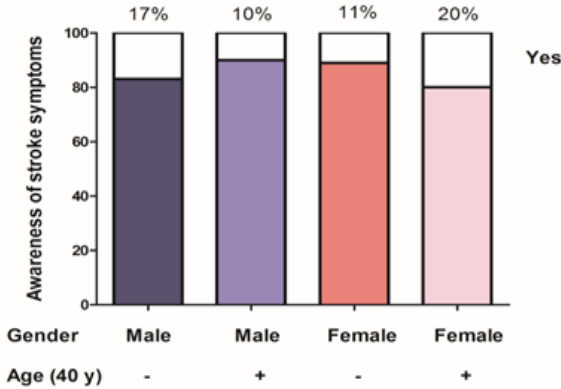

Figure 2. Rate of stroke symptoms awareness among the study participants

3.2   Prevalence of high risk of stroke

The percentage of individuals at high risk of developing stroke was higher in men (10% of men under 40 years and 22 % of men above 40 years of age compared to women (7 % of women under 40 and 11 % of women above 40 years old) as shown in Figure 3.
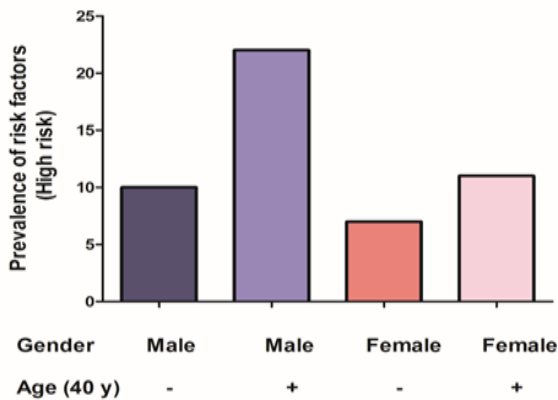

Figure 3. Prevalence of high risk of stroke among the study participants

3.3   Prevalence of moderate risk of stroke

Similarly the percentage of individuals with moderate risk of stroke was higher in men (3% of men under 40 years and 14 % of men above 40 years of age compared to women (4 % of women above 40 years old) as shown in Figure 4.
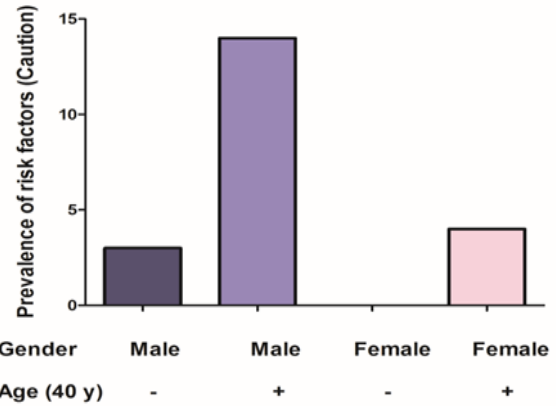

Figure 4. Prevalence of moderate risk of stroke among the study participants

4. Discussion

In an attempt to educate the local community of Tabuk city about this devastating disease, a series of public awareness campaigns took place in several public locations in the city.

Few neurological conditions are as complex and devastating as stroke (Moskowitz et al., 2010). Stroke has increased rapidly over the past two decades (Murray et al., 2012) and epidemiological data indicate that 16.9 million people suffer a stroke each year, providing a global incidence of 258/100,000 persons/year and accounting for 11.8% of total deaths worldwide (Bejot et al., 2016; Benjamin et al., 2017).

In addition, reports have shown that a person dies from stroke every 3 minutes, this has propelled the search for neuroprotective therapies to reduce cell death and infarct volume after stroke (Carmichael, 2005). Currently, thrombolysis with tissue plasminogen activator (t-PA) is the only effective therapy, but due to its narrow therapeutic window and safety concern; fewer than 5% of stroke patients receive this treatment (Woodruff et al., 2011). It is crucial to expand the narrow therapeutic opportunities for this devastating condition and to improve public awareness about the disease.

Stroke generally refers to a local interruption of blood flow to the brain due to blockage of a cerebral artery. Approximately 12% of strokes are hemorrhagic (rupture of a cerebral blood vessel; 9% intracranial, 3% subarachnoid), whereas the remaining 88% are ischemic and result from occlusion of a cerebral artery (either thrombolic or embolic) (Adibhatla et al., 2008). Within seconds to minutes after the loss of blood flow to a region of the brain, the energy failure rabidly initiates the ischemic cascade which comprises a series of subsequent biochemical events that eventually lead to disintegration of cell membranes and neuronal death at the center/core of the infarction (Dirnagl et al.,

1999). Cerebral ischemia evokes a strong inflammatory response characterized by the release of cytokines, chemokines, adhesion molecules and proteolytic enzymes that exacerbate tissue damage (Caso et al., 2007).

Studies reported that old age, high blood pressure, prior stroke, diabetes, high cholesterol, tobacco smoking and atrial fibrillation were the major risk factors for stroke (Donnan et al., 2008). Stroke is becoming a rapidly increasing problem and an important cause of illness and deaths in Saudi Arabia (Robert *et al.*, 2014a). A study reported that the risk factors significant for stroke in the Saudi population are systemic hypertension (38%), diabetes mellitus (37%), heart disease such as atrial fibrillation, ischemic heart disease, valvular disease, cardiomyopathy (27%), smoking (19%) and family history of stroke (14%) (Al Rajeh et al., 2002).

The results of the current study showed that, the general awareness about the characteristic symptoms of stroke was very low (10-20 %). In addition, the percentage of individuals at high risk of developing stroke was higher in men (10% of men under 40 years and 22 % of men above 40 years of age compared to women (7 % of women under 40 and 11 % of women above 40 years of age). Similarly the percentage of individuals with moderate risk of stroke was higher in men (3% of men under 40 years and 14 % of men above 40 years of age compared to women (4 % of women above 40 years of age).

Our results are confirmed with several previous studies, a study conducted on 500 Saudi patients with stroke indicated 68.4% were males and 31.6% were females (Al Rajeh et al., 2002) and stroke in the elderly (75 years and above) constituted 20.3% of all stroke reported in one study from Saudi Arabia (Benamer et al., 2009).

Interestingly, risk factor management is poor in Saudi Arabia, only 23% of hypertensive patients were aware of their blood pressure elevation (Benamer et al., 2009). In addition, diabetes is undiagnosed in around 28% of cases, of whom around half already have micro- and macrovascular complications (Saadi et al., 2007).

5. Conclusion

An educational campaign about prevalence and risk factors of stroke was conducted to raise public awareness of the local community of Tabuk city regarding this devastating disease. It was found that despite the spread of stroke risk factors, awareness of stroke is low. This situation urges and immediate intervention of the decision-makers through the participation of healthcare providers and universities in organizing campaigns and other public education programs to expand public knowledge about stroke.

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